INSTRUCTION MANUAL

Telonic

INDUSTRIES, INC

MODEL H-2

SERIAL NO. 2911

SWEEP GENERATOR

Telonic INDUSTRIES, INC. BEECH GROVE, INDIANA

WARRANTY

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INDUSTRIES, INC. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes and semiconductors excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

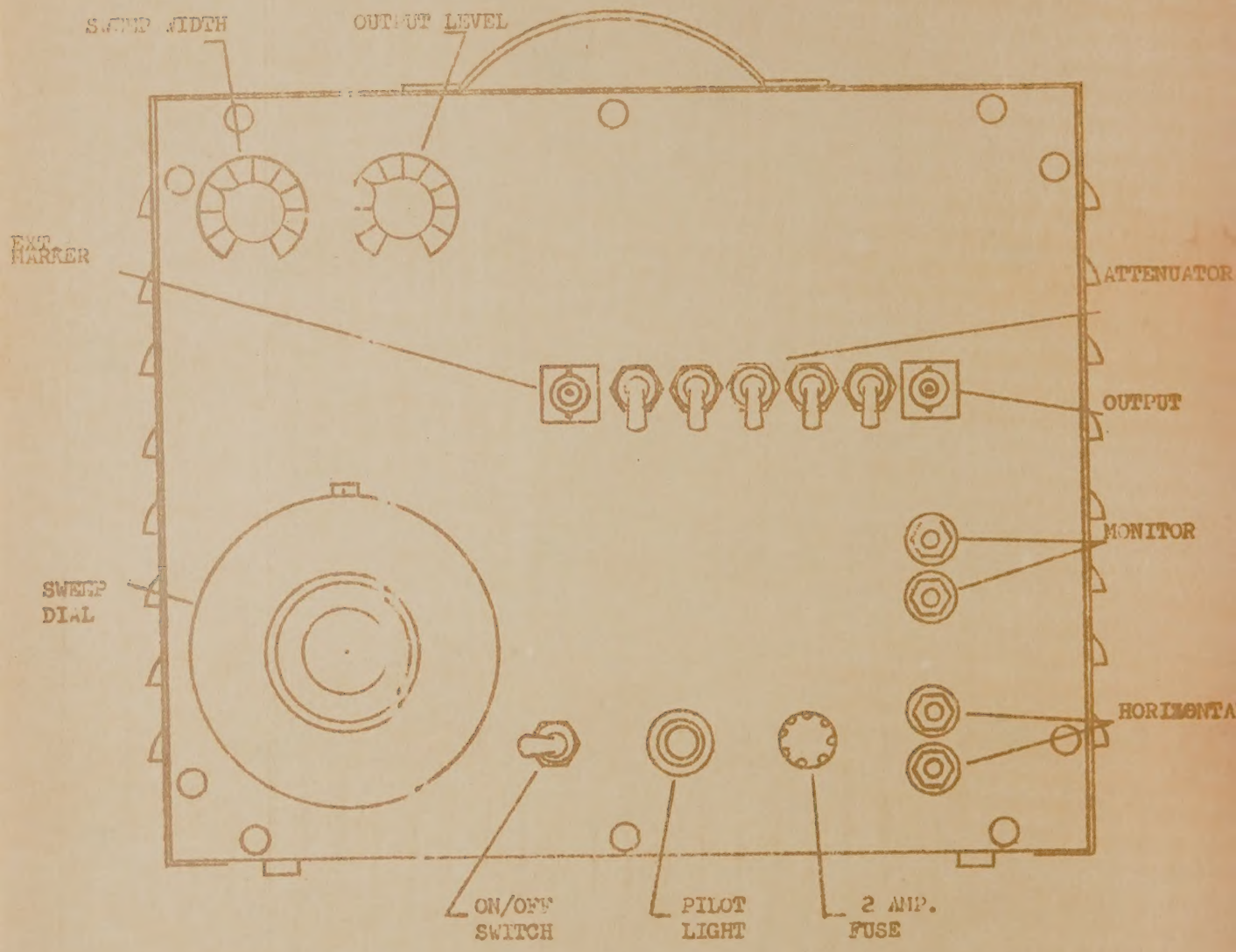
RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble should be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not.

SPECIFICATIONS
MODEL A-2
SWEEP GENERATOR

FREQUENCY RANGE	1-300 mc.
CENTER FREQUENCY RANGE	1-200 mc.
SWEEP WIDTH	0-200 mc.
OUTPUT VOLTAGE	.2 v.p. to p. into 50 ohm load
OUTPUT IMPEDANCE	50 ohms
FLATNESS	Within 15% over max. sweep width.
DISPLAY LINEARITY	1.1:1
ATTENUATION	Toggle Switch 20, 20, 10, 6, 3 db. plus vernier attenuation 0-10 db.
LEAKAGE	Less than 10 microvolts
SCOPE HORIZ. SWEEP VOLTAGE	Over 40 v.p. to p. linear triangular waveform.
ZERO BASE LINE	
SWEEP RATE	60 cps.
PROVISION FOR EXTERNAL MARKER INPUT	
TUBE COMPLEMENT	2 -- 6AF4A (Sonotone) 2 -- 12BY7 1 -- 5Y3 or 6X4 1 -- OB2 3 -- 6AU6 1 -- 12AX7
PHYSICAL DESCRIPTION	10" x 12" x 9" black finish case Gray anodized front panel Approx. weight -- 25#
POWER	110-120 v., 60 cps, 50 watts fused protected--2 amps.

PICTORIAL DIAGRAM OF MODEL H-2 SWEEP GENERATOR FRONT PANEL



DESCRIPTION OF FRONT PANEL CONTROLS

DIAL	Output frequency calibrated at zero sweep width. Reads center frequency.
SWEEP WIDTH	This potentiometer is used to vary the amount of voltage supplied to the vibrating capacitor and can be used to adjust the sweep width.
OUTPUT LEVEL	This potentiometer determines the average B plus supplied to the sweep oscillator and may be used as a vernier control of the output level.
STAND-BY Switch	Connected to OUTPUT LEVEL control. When turned to Stand-by, B plus is removed from all tubes, allowing filaments to remain at operating temperature.
ATTENUATOR	Toggle switch attenuator--the indicated amounts of attenuation are switched into the output circuit.
OUTPUT RECEPTACLE	BNC Connector
MONITOR	The MONITOR output may be connected to the vertical input of the scope to show the output response curve.
EXTERNAL MARKER INPUT	External marker jack for injection of external C.W. signal source, of .1 volts or more to produce "beat" or "birdy" type marker.
HORIZONTAL	These terminals are connected to the scope horizontal amplifier input. Using the waveform at these terminals will produce a more linear and more stable presentation than by using the internal horizontal drive of the oscilloscope.
FUSE	A 2-amp. 3AG fuse is used in the power input circuit.
ON/OFF	Power Switch
PILOT LIGHT	#47 Bulb

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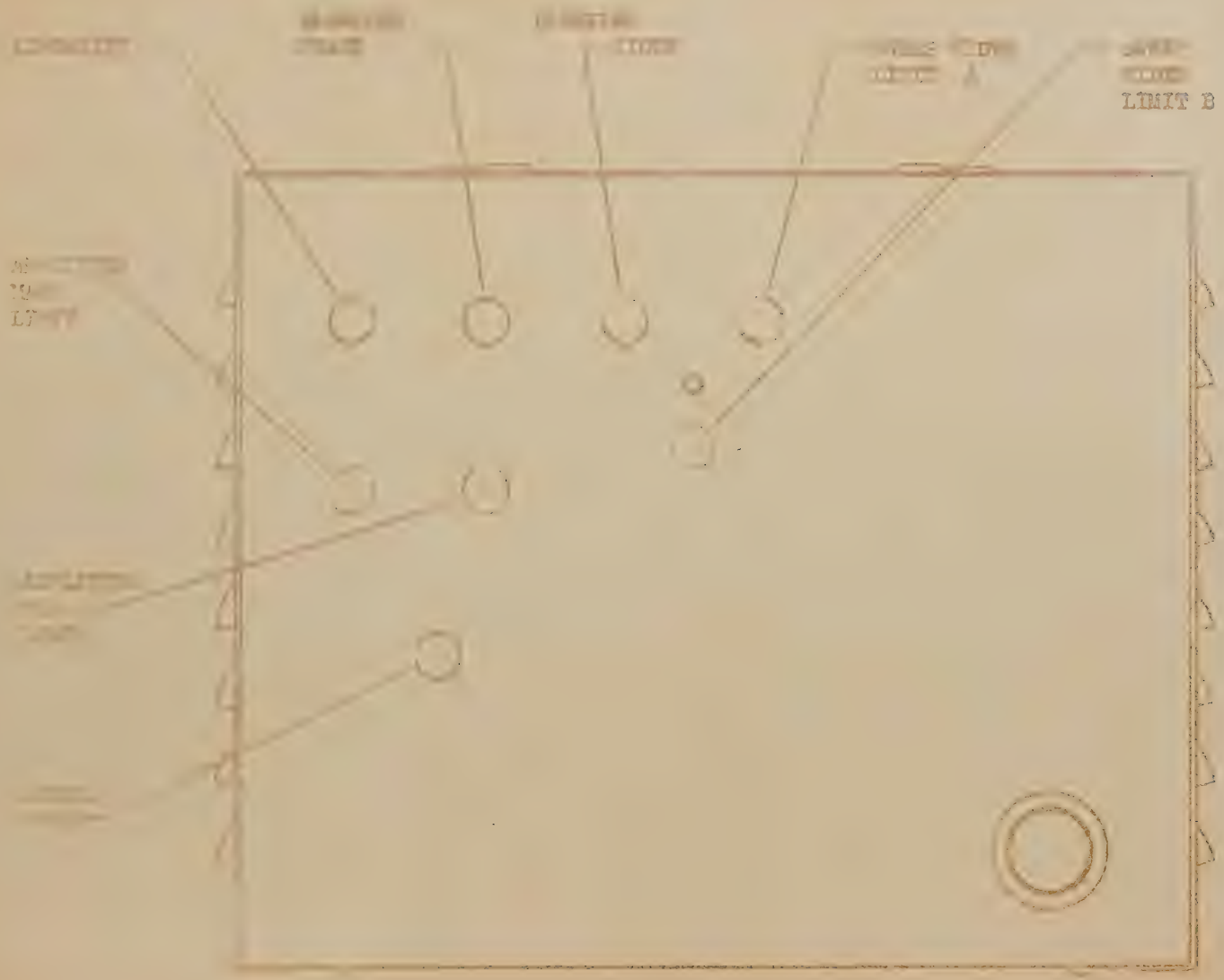
PICTORIAL DIAGRAM OF REAR PANEL CONTROLS

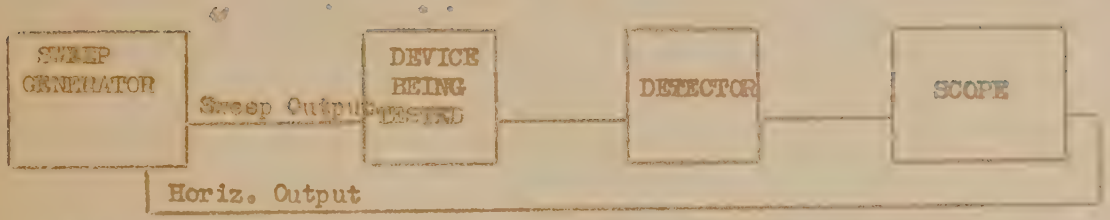


FUNCTION OF REAR PANEL CONTROLS

BLANKING WIDTH	This potentiometer is the grid resistor of the blanking pulse amplifier (V2). It is adjusted to blank slightly more than one-half of the sweep cycle to produce a zero base line.
BLANKING PHASE	By this screwdriver adjustment, the phase of the blanking voltage may be adjusted to blank the return sweep of the sweep oscillator
HORIZONTAL PHASE	By this screwdriver adjustment, the horizontal output may be adjusted to be in phase with the sweep oscillator.
AMPLITUDE MINIMUM LIMIT	This control is in series with the front panel control and is used to adjust the output level when the front panel control is at maximum position.
AMPLITUDE MAXIMUM LIMIT	This control is in parallel with the front panel control and is used to adjust the output level when the front panel control is at maximum position.
SWEEP WIDTH LIMIT A&B	The limit controls A&B determine the voltages supplied to the Front Panel Sweep Width dual potentiometer and is used to adjust the sweep width when the front panel control is set at maximum. The two sweep oscillators are operating out of phase with each other and the non-linearity present at such wide sweeps cancels out. Thus the two limits are set no only to provide full sweep width but are also set for best linearity.
LINEARITY	This control can be used to change the waveform of the horizontal output. Since the sweep is linear, the horizontal waveform is adjusted to be a linear sawtooth.

OPERATING INSTRUCTIONS

TYPICAL SET-UP



The following procedure is recommended for using this instrument:

1. Connect unit to 110-120 v. 60 cycle supply. This instrument may be used immediately after tube warm-up.

2. Connect HORIZONTAL terminals to scope horizontal amplifier input. The horizontal output voltage is over 15 volts peak to peak and should produce a full horizontal deflection on any osfilloscope.

3. Connect output to a detector as shown above, but omitting test device.

4. Set OUTPUT LEVEL control to maximum.

5. [illegible] ment is ready to use. However, should it be desirable to check these adjustments, follow these steps:

6. [illegible] accomplished as follows:

   a. With an output detector connected to the scope vertical input, [illegible] the marker until the marker pip appears on the scope trace.

   b. [illegible] indicates the point at which the sweep oscillator reaches the end of its sweep and reverses direction.

   c. The BLANKING PHASE is adjusted to cut off at this point.

Adjust BLANKING WIDTH until the sweep oscillator is only operating during one-half of the sweep cycle.

Adjust the HORIZONTAL PHASE control so that the phase of the horizontal output corresponds to the phase of the sweep oscillator. Since the blanking is already adjusted to the ends of the sweep, it is only necessary to adjust the ELECTRICAL LENGTH to place the lowest frequency on one side of the sweep and the highest frequency at the other. When the HORIZONTAL and BLANKING PHASE & WIDTH controls are properly adjusted, the monitor waveform will have a rectangular shape.

Set front panel OUTPUT LEVEL control and SWEEP WIDTH control to HI and adjust the Output Maximum LEVEL control (Rear Panel) for maximum flat output.

Set front panel OUTPUT LEVEL for minimum output and adjust OUTPUT ATTENUATOR LEVEL control for approx. 10 db. over that of the attenuator switch for comparison.

Adjust the linearity control to produce a horizontal output waveform with a linear waveform on the positive going side of the sawtooth.

With the SWEEP WIDTH set to maximum, adjust the two SWEEP WIDTH LIMIT controls for greatest sweep width yet maintaining a linear display. Perfect linearity can be obtained by balancing the sweep width of the two oscillators.

SWEEP
OSCILLATOR
LEVELING &
CONTROL CIR
MIXER

GENERAL DESCRIPTION

BLANKING AND HORIZONTAL CIRCUITRY

The blanking and horizontal sweep voltages are originated by square wave producing circuits. The 6.3 v. filament and the 6.3 v. phasing windings of the power transformer are connected in series to obtain a 12.6 voltage C.T. to ground. This voltage is connected through the phasing network to one of the grids of the 12AX7 and to the grid of the 6AU6.

The square wave output of the 6AU6 controls the 1N2X7 sweep oscillator voltage regulator tube and thus deprives the tuned oscillator of voltage during ½ of each cycle. The phase of this blanking voltage is adjusted by the rear panel control so that the lowest frequency being swept is located at the left of the scope presentation. The square wave output of one triode of the 12AX7 is applied to the other triode through an RC network. This is designed to produce a linear sawtooth waveform.

The second triode is connected as cathode follower and produces the same sawtooth output. This horizontal sweep voltage is used to produce the frequency sweep. An RC network connecting this triode to the horizontal terminals distorts this sawtooth. The linearity control on the rear panel is part of this network and is adjusted for best display linearity.

AUTOMATIC OUTPUT LEVELING CIRCUITRY

A sample of the sweep oscillator output, at the input to the attenuator is detected and amplified and is used to control the plate voltage of the sweep oscillator. The OUTPUT LEVEL control adjusts the bias on the first stage of the amplifier. This causes the DC levels in the entire amplifier to change and varies the average B plus supplied to the sweep oscillator from a minimum of 25 v. to over 100 v. A small decrease in the sweep voltage causes a large increase in the B plus supplied to the sweep oscillator and thus counteracts any amplitude variation as the position is tuned over the range.

The operation of this circuit and of the sweep oscillator may be viewed at the feed-thru connector on the rear of the attenuator (see Fig. 1 or 2). The waveform at this point should normally show a flat output level over the entire band. Adjusting the OUTPUT LEVEL will change this level.

MAINTENANCE

By use of the schematic, operational diagram and the terminal board layout, voltage and waveforms, ordinary difficulties can be readily located and remedied. The following trouble-shooting chart is an additional aid to servicing:

SYMPTOMS	POSSIBLE CAUSES & REMEDIES
Pilot light off and unit fails to operate	Fuse open - replace. If 2nd fuse opens - look for cause of overload, shorted wiring, components, etc. (The 150 ohm 1 watt resistors on terminal board burn out if the B+ circuit is overloaded and this protects the rectifier and transformer.)
No Horizontal Output	Look for difficulty in the sawtooth circuitry V1 using terminal board layout and schematic to check waveforms and voltages.
RF Output is low or zero	Check B+ to sweep oscillator P. & (V5 and V9.) It should be a square wave of 25-100 v. of positive polarity and should vary as the output level control varies. If it is normal, look for RF difficulties bad tube, shorted or open wiring, defective components, etc. If the voltage is low and does not respond to the leveler control, remove first V4 and then V2. When either of these tubes conducts, the voltage on grid of V5 and V9 (Pin 2) is reduced and thus decreases the B+ to the sweep oscillator. If removal of V2 allows B+ on V5 and V9 (Pin 2) to return to normal, check the blanking width control, the tube and associated circuitry. If removal of V4 causes the B+ to return to normal, Check the leveler controls, V3 and V4 and circuitry.
Low Output	Replace mixer diode observing correct polarity as noted on chassis layout.

MAINTENANCE

This instrument is designed for easy maintenance. All tubes and transistors are of standard types and are easy to remove and replace. There are a few points that need to be mentioned.

MONITOR FOR CHECKING PERFORMANCE

The detector crystal serves as a monitor for checking the sweep generator performance. With the output control set for maximum output, the voltage at this point should be over 1.0 v. A lower voltage than this indicates poor operation of the crystal diode, sweep oscillator or amplitude leveling circuit.

FAULTY OUTPUT SAMPLING DIODE

[illegible] to ground; or the crystal is making poor contact.

SWEEP OSCILLATOR TUBE

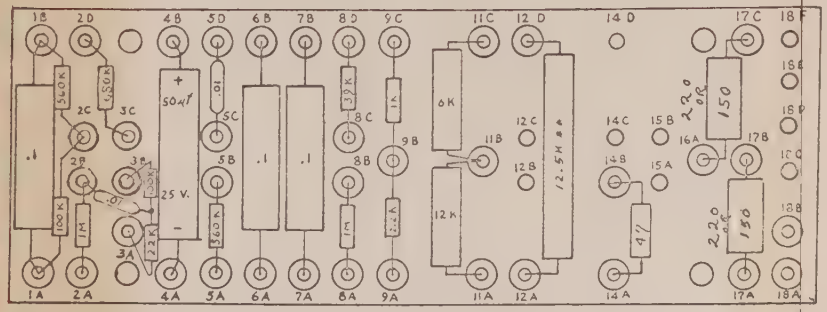
[illegible] off at certain frequencies, the 6AF4A should be replaced. [illegible] appears as a tendency of the leveling circuit to oscillate at an audio frequency. This effect occurs when the B plus voltage level is too low for the sweep oscillator to oscillate but when the amplifier is not biased down to the point where it will allow the sweep osc. to stop. It is more likely to take place at the extreme high end of the band at low operating levels. Usually the amount of attenuation possible through use of the OUTPUT LEVEL control, before this oscillation takes place, is a direct indication of the quality of the sweep oscillator tube (6AF4A).

When this tube is replaced, the best results can be obtained by trying several tubes and then choosing the one that produces the most constant output. The Sonotone 6AF4A operates better in this circuit than other brands.

TUNING MECHANISM

[illegible] lines. This grease has exceptionally good contact and wearing qualities and will last indefinitely. [illegible] years of use. In the event that electrical noise develops in spite of all precautions made in the manufacture, the following procedure is recommended:

1. Pry brass keeper loose from contact rotor.
2. Pull rotor away from lines.
3. [illegible] pressure.
4. Replace rotor being very careful not to damage contacts.

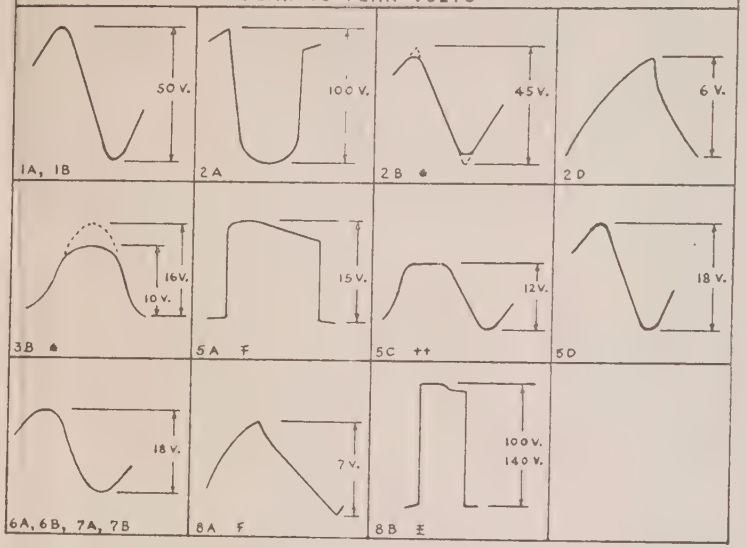


VOLTAGE CHART

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	180	87			4.0			350	2.7 ▼		360	360		-2.2		340 AC	340 AC	LINE
B		152		3.0 ✱	19	-2.6		80 ✱			130						340 AC	LINE
C			283		-6.0			58 ✱	20		19						340 AC	
D		358						80 ✱				105						
E		✓																
F																		

ALL VOLTAGES TAKEN WITH 20,000 OHM/VOLT METER.
OUTPUT LEVEL AND SWEEP WIDTH CONTROLS AT MAXIMUM ROTATION.
✱ VOLTAGE VARIES WITH SETTING OF OUTPUT LEVEL CONTROL.
ALL VOLTAGES MAY VARY ±10%.

TYPICAL WAVE FORMS
PEAK TO PEAK VOLTS



FRONT CONTROLS AT MAX. C.W. ROTATION SCOPE SET FOR 60~ SWEEP RATE, LINE SYNC.

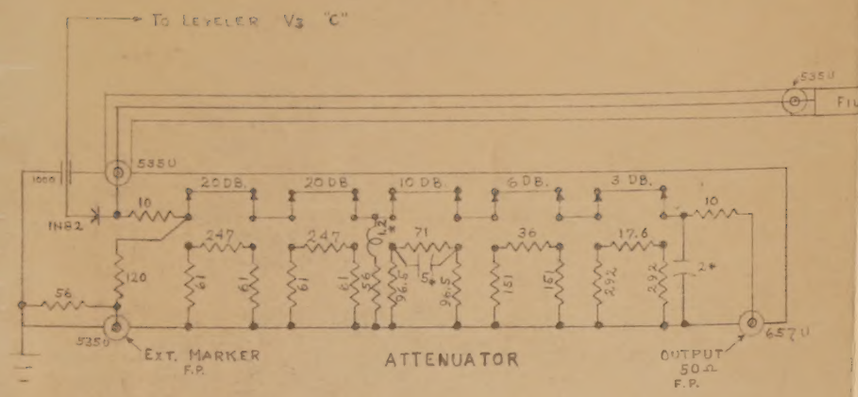
✱ SHAPE VARIES WITH SWEEP WIDTH CONTROL.
∓ VARIES AMPLITUDE WITH OUTPUT LEVEL CONTROL.
++ VARIES AMPLITUDE WITH BLANKING WIDTH CONTROL.
± VARIES AMPLITUDE WITH OUTPUT LEVEL CONTROL AND FREQUENCY SETTING.

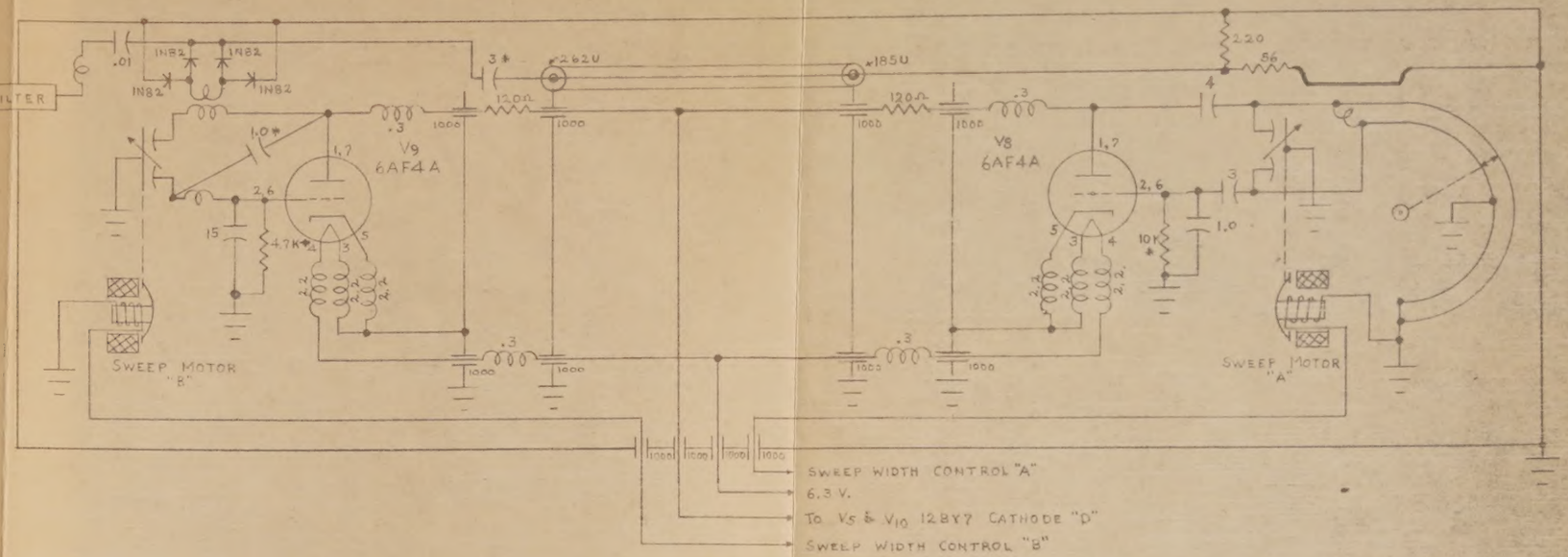
REVISIONS NO.	DATE

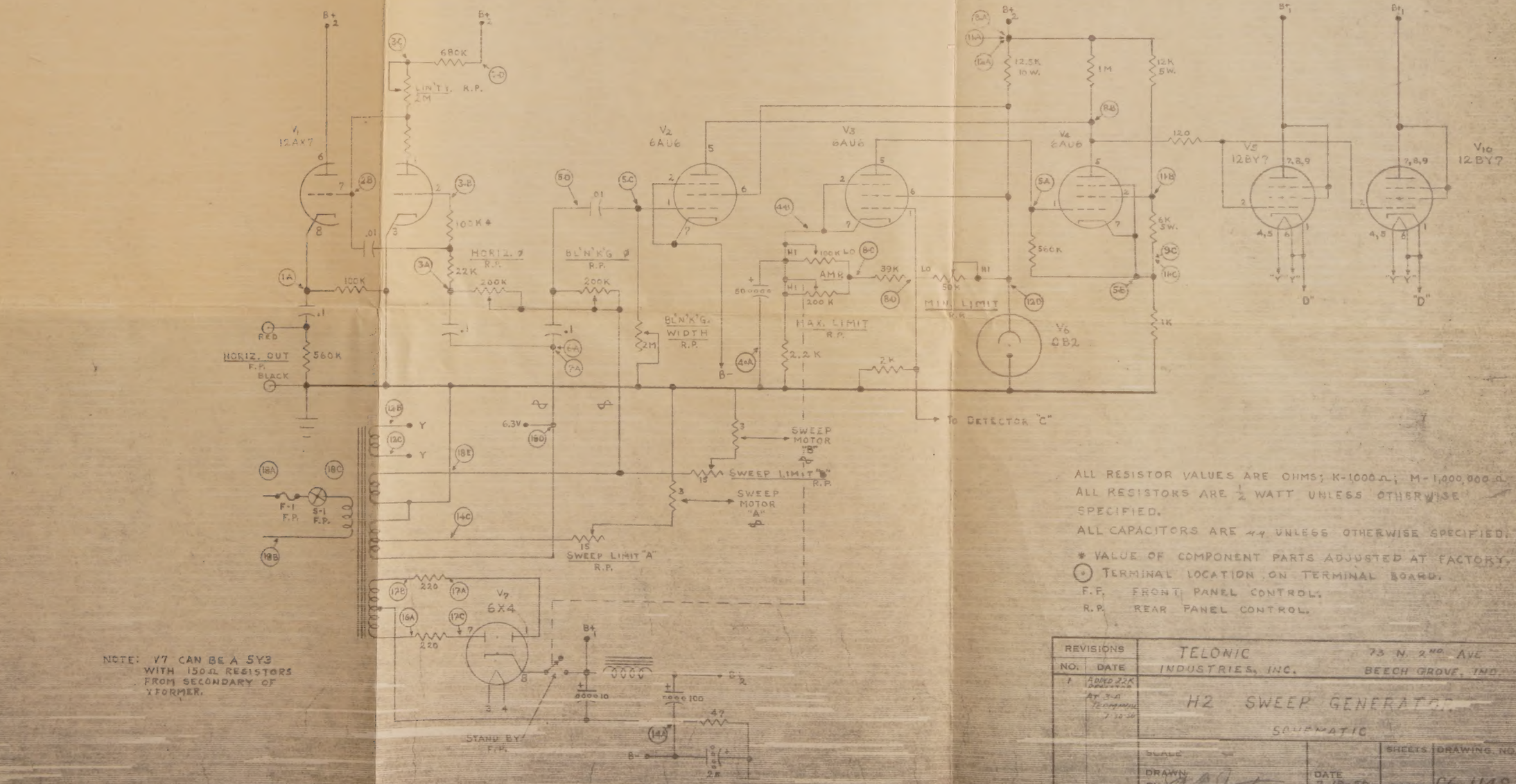
Telonic INDUSTRIES 73 N. 2ND. AVE. BEECH GROVE INDIANA

H2 TERMINAL BOARD
VOLTAGE LEVELER & POWER SUPPLY

SCALE		SHEETS	DRAWING. NO.
DRAWN BY [illegible]	DATE Feb. 14, 1956	SHEET 1	D6-3148
APP'VD BY ROA	DATE		





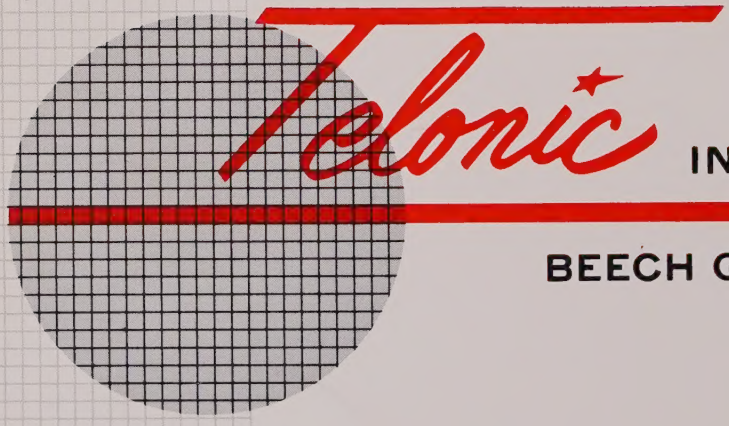


NOTE: V7 CAN BE A 5Y3 WITH 150Ω RESISTORS FROM SECONDARY OF YFORMER.

ALL RESISTOR VALUES ARE OHMS; K-1000Ω; M-1,000,000Ω.
ALL RESISTORS ARE ½ WATT UNLESS OTHERWISE SPECIFIED.
ALL CAPACITORS ARE μf UNLESS OTHERWISE SPECIFIED.

* VALUE OF COMPONENT PARTS ADJUSTED AT FACTORY.
(·) TERMINAL LOCATION ON TERMINAL BOARD.
F.F. FRONT PANEL CONTROL.
R.P. REAR PANEL CONTROL.

REVISIONS NO.	DATE		
1	ADDED 22K RESISTOR AT 3-A TERMINAL 7-15-50	TELONIC INDUSTRIES, INC.	73 N. 2ND. AVE. BEECH GROVE, IND.
		H2 SWEEP GENERATOR SCHEMATIC	
		SCALE —	SHEETS — DRAWING NO.
		DRAWN BY D. E. Foster DATE 7-15-50	SHEET 1 C6-1148
		APP'D BY — DATE	



INDUSTRIES INC.

BEECH GROVE, INDIANA